A Qualitative Comparison between MISR and Cloud Radar Cloud Heights at the North Slope of Alaska ARM Site

P. Zuidema
NRC/NOAA
paquita.zuidema@noaa.gov

T. Uttal
NOAA

C. Moroney
Jet Propulsion Laboratory, Pasadena, CA

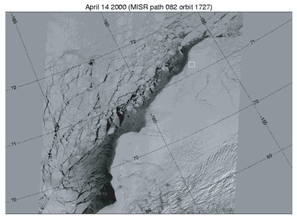
NOAA Environmental Technology Laboratory, Boulder, CO

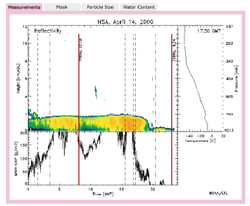
A qualitative comparison is done between cloud heights as perceived by a surface-based cloud radar located at Pt. Barrow, Alaska (71.2N, 156.8W) and as determined operationally with Multiangle Imaging SpectroRadiometer (MISR) data. The MISR heights and winds are codetermined using a stereo-matching process. The cloud radar cloud heights are resolved at a 45 m resolution. Saturation of the cloud radar signal through precipitation is not common at this site. The high-latitude location can experience a MISR overpass about every two days, occurring roughly at 10:10 AM local time or ~23:00 UTC. The Pt. Barrow site is also known as the North Slope of Alaska (NSA) ARM CART Site.

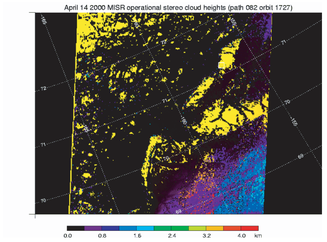
All MISR orbits with coincident cloud radar data for the years 2000 and 2001 have been identified. MISR images of nadir radiance and of the cloud heights are available through http://www.etl.noaa.gov/~pzuidema/misrnsa.html, and the coincident cloud radar images are at http://www.etl.noaa.gov/arctic/nsa/. Data from the sunlit portion of 2002 will become incorporated as it becomes available.

21 MISR orbits from the year 2000 have operationally-derived stereo cloud heights as well as coincident cloud radar data. The wind determination was not incorporated into the stereo algorithm until sometime in October. In the year 2001 the cloud radar malfunctioned and data are only available for August and September, coinciding with 13 MISR orbits. A good statistical comparison is not yet possible, but some individual comparisons can be presented. A white box of roughly 10 km^2 is centered on the Pt. Barrow site in the following images; the overall MISR swath is rought 360 km wide. The cloud height images do not all use the same height scale. No conscious bias was incorporated into the case selection.

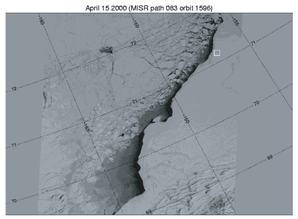
April 14, 2000:: Cloud at the NSA site, occurring above a snow-covered surface, is successfully identified as such by MISR, although placed at a much higher height. Ice floes are also identified as (high) cloud, however.

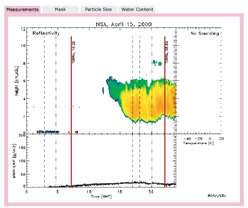


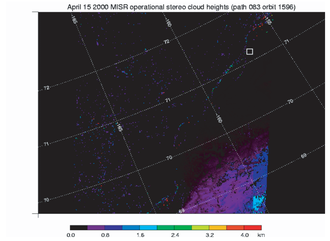




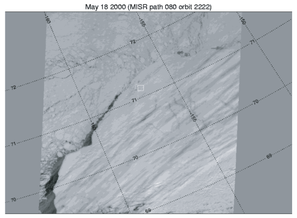
April 15,2000: The next day. Ice floes are not mis-identified as cloud, but neither is the cloud occurring over the NSA site detected by MISR.

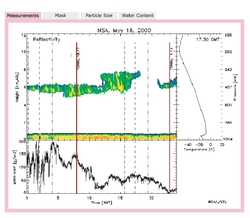


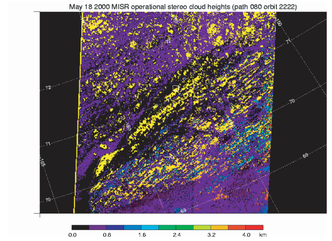




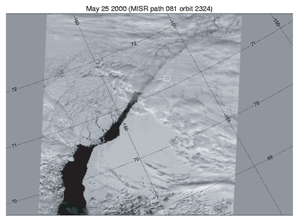
May 18,2000: high, thin clouds over snow and ice are successfully identified by MISR but placed too high, possibly because winds have not yet been accounted for

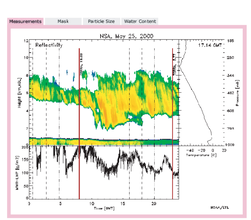


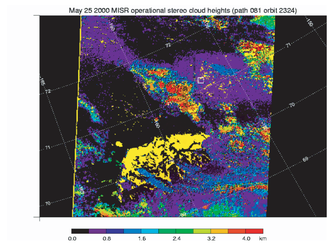




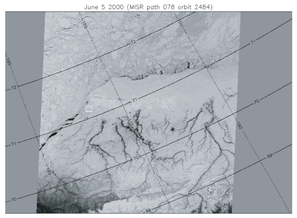
May 25, 2000: Again good pattern identification of the clouds by MISR, but now clouds are placed too low

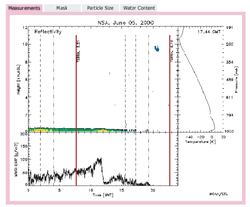


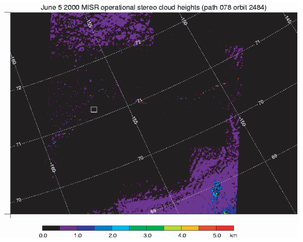




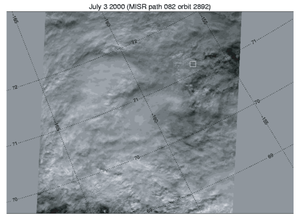
June 5, 2000: complex, mostly white, clear-sky scene correctly identified as such by MISR

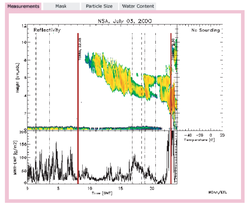


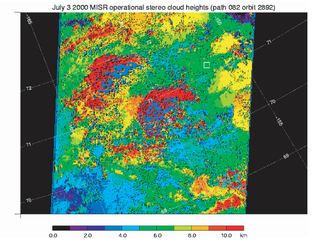




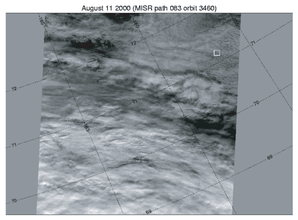
July 3, 2000: multi-layered and varying cloud heights seen both in radar and in the MISR cloud heights

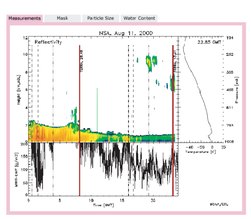


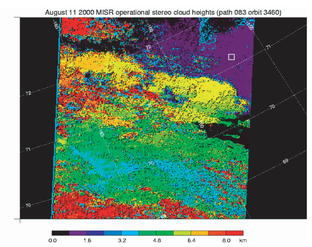




August 11, 2000: Low cloud at NSA site identified as such by MISR







September 21, 2001: Wind retrieval now long incorporated into the stereo algorithm. Winds are determined on roughly 70 km^2 domains and differences in winds from one domain to the next result in strong height discontinuities. This case is particularly bad, perhaps because thin upper level clouds are sometimes perceived by the cameras at the low viewing angles (and used for the winds determination), and sometimes not. Not all cases with co-determined winds and heights show such strong discontinuities !